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(54) Title: EDIBLE FUNGI

(57) Abstract: An edible formulation, suitable for vegans, comprises edible fungal particles of a filamentous fungus and calcium ions.



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Edible Fungi

This invention relates to edible fungi and particularly, although not exclusively, relates to edible formulations comprising edible fungal particles for use as meat
5 substitutes.

It is known, for example from WO 00/15045 (DSM), WO96/21362 (Zeneca) and WO95/23843 (Zeneca) to use edible filamentous fungi as meat-substitutes, for example in the preparation of burgers and sausages. In such uses, filaments of the
10 fungi are bound together, for example with egg albumin, and are texturised so that the product resembles muscle fibres and therefore has a meat-like appearance and texture. Meat substitutes of the type described have been widely commercially available for many years under the trade mark QUORN.

15 In some circumstances, it is desirable to reduce or even eliminate the amount of egg albumin used with edible fungus in the manufacture of meat-substitutes for example on cost grounds or to produce a product suitable for vegans.

It is an object of the present invention to address the aforementioned problem.
20

According to a first object aspect of the invention, there is provided an edible formulation comprising edible fungal particles of a filamentous fungus and calcium ions.

25 One class of people may find it acceptable, generally, to avoid all animal products except dairy products. Thus, such a class of people may find an edible formulation which incorporates whey protein (e.g. up to about 10 wt% whey protein) as acceptable. Thus, in one embodiment, said edible formulation includes no animal products except, optionally, dairy products. However, in a second embodiment, said
30 edible formulation is suitable for vegans. Consequently, in this embodiment, said edible formulation preferably includes 0 wt% of components derived from animals.

Thus, it follows from the aforementioned that said formulation preferably includes 0 wt% of a hydrocolloid derived from an animal source. Said formulation
35 preferably includes 0 wt% of egg albumin.

Said edible formulation is preferably a meat substitute.

Said edible formulation suitably includes at least 5 wt%, preferably at least 15 wt%, more preferably at least 20 wt% of said filamentous fungus on a dry matter basis. In some cases, for example, when said edible formulation mimics a meat product (e.g. strips of meat or mince) which may be used as a food ingredient, said edible formulation may include higher levels of said filamentous fungus, for example greater than 40 wt% or greater than 60 wt% of filamentous fungus on a dry matter basis. Said edible formulation may include 5 to 80 wt%, preferably 15 to 75 wt% of filamentous fungus on a dry matter basis.

Said edible formulation suitably includes at least 2,000mg, preferably at least 4,000mg, more preferably at least 6,000mg, especially at least 8,000mg of calcium ions per Kg of filamentous fungus on a dry matter. Said edible formulation suitably includes less than 25,000mg, preferably less than 20,000mg, of said calcium ions per Kg of filamentous fungus on a dry matter basis.

Said edible formulation may include intracellular calcium ions (e.g. within the edible fungal particles) and extracellular calcium ions. Said edible formulation suitably includes the following extracellular levels of calcium ions: at least 2,000mg, preferably at least 4,000mg, more preferably at least 6,000mg, especially at least 8,000mg per Kg of filamentous fungus on a dry matter basis. The maximum extracellular level of calcium ions is suitably less than 25,000mg, preferably less than 20,000mg, per Kg of filamentous fungus on a dry matter basis.

The total amount of calcium ions in said edible formulation is suitably at least 5,000mg per Kg, preferably at least 10,000mg per Kg, of filamentous fungus on a dry matter basis. The total amount of calcium ions may be less than 40,000mg or less than 20,000mg per Kg of filamentous fungus.

Said edible formulation may include at least 0.100 wt%, preferably at least 0.200 wt%, more preferably at least 0.300 wt%, of calcium ions in total, on a dry weight basis. It may include less than 1 wt% or less than 0.8 wt% of calcium ions in total, on a dry weight basis.

Said edible formulation may include at least 50 wt%, preferably at least 60 wt%, water. Said formulation may include less than 85 wt% or less than 80 wt% water. Said edible formulation may include the aforementioned levels of water after a precursor of said edible formulation has been treated (e.g. cooked such as by steaming, chilling and/or freezing) to develop texture.

Said edible formulation may include a polysaccharide, for example a sulphonated polysaccharide, for example carrageenan. Said edible formulation, on a dry weight basis, suitably includes at least 0.1 wt%, preferably at least 0.5 wt%, more preferably at least 0.9 wt% of said polysaccharide, for example carrageenan. It may include less than 2 wt% of said polysaccharide.

Said edible formulation may include an alginate, for example a salt of alginic acid such as sodium alginate. Said edible formulation, on a dry weight basis, suitably includes 0.01 wt%, preferably at least 0.05 wt%, more preferably at least 0.12 wt% of alginate. It may include less than 1 wt%, preferably less than 0.5 wt% of alginate.

Said edible formulation may include gluten, for example wheat gluten. Said edible formulation, on a dry weight basis, suitably includes at least 0.1 wt%, preferably at least 1 wt%, more preferably at least 1.5 wt% of said gluten. It may include less than 5 wt% of said gluten.

Said edible formulation may include a protein source in addition to said edible fungal particles and which is not a wheat-based protein. Said protein source (A) may be a source of vegetable protein. Said protein source (A) may be a potato protein source. Said edible formulation, on a dry weight basis, may include at least 1 wt%, preferably at least 5 wt% of protein source (A). It may include less than 20 wt% of protein source (A).

It is found that, if calcium chloride alone is used in the formulation, even at a minimum level to achieve the effect described herein, a disagreeable taste may result. Accordingly, steps may be taken to counter the disagreeable taste. It has been found that use of calcium acetate is able to do this. Thus, said edible formulation preferably includes acetate moieties (which may have been initially incorporated into the formulation as calcium acetate).

In said edible formulation, the ratio of the wt% of acetate ions divided by the wt% of filamentous fungus on a dry matter basis is suitably at least 0.005, preferably at least 0.01. Said ratio may be less than 0.04, for example less than 0.03.

5 Said acetate ions are suitably extra-cellular ions.

Said edible formulation may include at least 0.10 wt%, preferably at least 0.40 wt% of acetate ions on the dry matter basis. It may include less than 2.00 wt%, for example less than 1.00 wt% of acetate ions on a dry matter basis.

10

In a first preferred embodiment, said edible formulation may include:

- at least 2,000mg, for example at least 5,000mg, of calcium ions per Kg of filamentous fungus on a dry matter basis;
- 15 - at least 50 wt% of water.

In a second preferred embodiment, said edible formulation may include:

- 5,000mg of calcium ions per Kg of filamentous fungus on a dry matter basis;
- 20 - less than 25,000mg of calcium ions per Kg of filamentous fungus on a dry matter basis;
- at least 50 wt% of water;
- 0 wt% of egg albumin.

25 In said first and second preferred embodiments, preferably in said edible formulation, the ratio of the wt% of acetate ions divided by the wt% of filamentous fungus on a dry matter basis is at least 0.005 and is less than 0.03.

Said edible formulation preferably includes at least 0.10 wt%, preferably at least 30 0.50 wt%; and suitably includes less than 1.5 wt%, or less than 1.1 wt% of acetate ions, on a dry matter basis.

As described, fungal particles suitably comprise a filamentous fungus. Said filamentous fungus preferably comprises fungal mycelia and suitably at least 80 wt%, 35 preferably at least 90 wt%, more preferably at least 95 wt% and, especially, at least 99 wt% of the fungal particles in said formulation comprise fungal mycelia. Some

filamentous fungi may include both fungal mycelia and fruiting bodies. Said fungal particles preferably comprise a filamentous fungus of a type which does not produce fruiting bodies. Where, however, a filamentous fungus of a type which produces fruiting bodies is used, the fungal particles in said composition suitably include at least 5 80 wt%, preferably at least 90 wt%, more preferably at least 95 wt% of fungal mycelia. Preferably, said fungal particles comprise substantially only fungal mycelia - that is, said fungal particles in said composition preferably do not include any fruiting bodies.

Preferred fungi for said fungal particles have a cell wall which includes chitin 10 and/or chitosan. Preferred fungi have a cell wall which includes polymeric glucosamine. Preferred fungi have a cell wall which includes β 1-3 and 1-6 glucans.

Said fungal particles may include fungal cells of the order Mucorales as described in WO 00/15045 (DSM). 15

Said fungal particles preferably comprise fungus selected from fungi imperfecti.

Preferably, said fungal particles comprise, and preferably consist essentially of, cells of *Fusarium* species, especially of *Fusarium venenatum* A3/5 (formerly classified 20 as *Fusarium graminearum*) (IMI 145425; ATCC PTA-2684 deposited with the American Type Culture Collection, 10801 University Boulevard, Manassas, VA.) as described for example in WO96/21361 (Zeneca) and WO95/23843 (Zeneca).

Preferably, said fungal particles are non-viable. Preferably, said fungal particles 25 have been treated to lower the level of RNA which they contain. Thus, the level of RNA in the fungal particles used is preferably less than the level in an identical fungus when in a viable state. The level of RNA may be reduced as described in WO95/23843. Said fungal particles suitably have a RNA content on a dry weight basis of less than 1.9 wt%, for example 1.7 wt% or less.

30

Fungal particles in said formulation may comprise filaments having lengths of less than 1000 μ m, preferably less than 800 μ m. Said filaments may have a length greater than 100 μ m, preferably greater than 200 μ m. Preferably, fewer than 5 wt%, preferably substantially no, fungal particles in said formulation have lengths of greater 35 than 5000 μ m; and preferably fewer than 5 wt %, preferably substantially no, fungal particles have lengths of greater than 2500 μ m. Preferably, values for the number

average of the lengths of said fungal particles in said formulation are also as stated above.

5 Fungal particles in said formulation may comprise filaments having diameters of less than 20 μm , preferably less than 10 μm , more preferably 5 μm or less. Said filaments may have diameters greater than 1 μm , preferably greater than 2 μm . Preferably, values for the number average of said diameters of said fungal particles in said formulation are also as stated above.

10 Fungal particles in said formulation may comprise filaments having an aspect ratio (length/diameter) of less than 1000, preferably less than 750, more preferably less than 500, especially of 250 or less. The aspect ratio may be greater than 10, preferably greater than 40, more preferably greater than 70. Preferably, values for the average aspect ratio of said fungal particles (i.e. the average of the lengths of the
15 particles divided by the average of the diameters of the fungal particles) in said formulation are also as stated above.

In said edible formulation, the ratio of the wt% of filamentous fungus (on a dry matter basis) divided by the wt% of water is at least 0.05, preferably at least 0.10.
20 The ratio may be less than 0.5 or less than 0.4.

Said edible formulation may be provided in a package. Thus, said edible formulation is suitably surrounded by packaging material which may comprise a receptacle. Said package may include at least 50g or at least 100g of said edible
25 formulation. Said package may include said edible formulation and include at least 10g of edible fungal particles on a dry matter basis. Said package may include an edible formulation which includes at least 20 wt%, for example at least 45 wt% water.

According to a second aspect of the invention, there is provided a method of
30 making an edible formulation, the method comprising:

- (i) selecting a formulation comprising edible fungal particles of a filamentous fungus;
- (ii) contacting said formulation with calcium ions.

Contact may be effected so as to produce an edible formulation with calcium ions as described in the first aspect and/or at levels described in the first aspect. Thus, the edible formulation prepared may be as described in the first aspect.

5 Said edible fungal particles selected in step (i) are suitably fungal particles which have been treated after removal from a reactor in which the particles are produced in a fermentation process.

Said edible fungal particles selected in step (i) are preferably not viable.

10 Said edible fungal particles selected in step (i) preferably have been treated to lower the level of RNA they contain.

Said edible fungal particles selected in step (i) preferably have an RNA content on a dry weight basis of less than 1.9 wt%, for example 1.7 wt% or less.

15

Any feature of any aspect of any invention described herein may be combined with any other invention described herein mutatis mutandis.

20 Specific embodiments of the invention will now be described, by way of example, with reference to the accompanying drawing, in which Figure 1 is a schematic representation of steps in the production of mycoprotein-containing products for human consumption.

The following materials are referred to hereinafter:

25

Mycoprotein paste – Mycoprotein paste-refers to a visco-elastic material comprising a mass of edible filamentous fungus derived from *Fusarium venenatum* A3/5 (formerly classified as *Fusarium graminearum* Schwabe) (IMI 145425; ATCC PTA-2684 deposited with the American type Culture Collection, 12301 Parklawn Drive, Rockville Md. 20852) and treated to reduce its RNA content to less than 2% by weight by heat treatment. Further details on the material are provided in WO96/21362 and WO95/23843. The material may be obtained from Marlow Foods Limited of Stokesley, U.K. It comprises about 23-25 wt % solids (the balance being water) made up of non-viable RNA reduced fungal hyphae of approximately 400-750 µm length, 3-35 5 µm in diameter and a branching frequency of 2-3 tips per hyphal length.

Calcium chloride solution – refers to a 36 wt% aqueous solution of calcium chloride.

Calcium acetate – refers to calcium acetate in solid form.

5

Sodium alginate refers to sodium alginate in a solid form.

In the examples which follow, Example 1 provides a general method of producing mycoprotein-containing products. Example 2 - 5 provide details of specific products which are suitable for consumption by vegans. It is found that the addition of calcium cations (via calcium chloride and calcium acetate) to the ingredients described in the examples produce a rise in firmness and produces acceptable quality of the product produced. It is believed the calcium cations interact with the mycoprotein paste to increase its firmness and strength.

15

Example 1 – General process for preparation of products

This is summarized in Figure 1. Mycoprotein paste is mixed with other ingredients it is desired to incorporate to produce a substantially homogenous mass of a mycoprotein-containing foodstuff (for example meat-like pieces, mince, sausages and roast meats). The homogenous mass is put through a former and then a steamer (e.g. over 95°C for 35-45 minutes). The steamed product is then chilled (e.g. -5 to -10°C for about 20 minutes) which improves the texture of the product by making it slightly firmer. There follows an optional size reduction process followed by a second texturization step involving freezing. Thereafter, products are weighed and packaged prior to the final texturization step at -18°C in a cold store for at least 7 days. Thereafter product can be delivered to retail outlets for sale to customers.

25

Example 2 – Preparation of mycoprotein-containing pieces

30

Following the general procedure described in Example 1, the ingredients referred to in Table 1 were combined to produce the final product.

Table 1

Vegan Pieces recipe (Table 1)		
Ingredient	Wet weight (g/kg)	Dry weight g/kg
Mycoprotein Paste	884.20	221.00
Water	12.00	<1.00
Flavour 1	10.00	9.50
Potato Protein	32.00	30.40
Vital Wheat Gluten	10.00	9.50
Calcium Acetate	4.00	3.80
Calcium Chloride Solution	12.00	4.30
Sodium Alginate	0.80	0.76
Flavour 2	3.00	2.85
Carageenan	4.00	3.80
Wheat Fibre	20.00	19.00
Pea Fibre	8.00	7.60
Total	1000.00	312.60

- 5 It should be appreciated that the steaming/chilling process affects the level of water in the final product which is generally in the range 70 to 77 wt% in total.

Example 3 – Preparation of mycoprotein-containing mince

- 10 Following the general procedure described in Example 1, the ingredients referred to in Table 2 were combined to produce the final product.

Table 2

Vegan Mince recipe		
Ingredient	Wet weight (g/kg)	Dry Weight(g/kg)
Mycoprotein Paste	888.20	222.00
Water	0.00	0.00
Potato Protein	50.00	47.50
Calcium acetate	4.00	3.80
Calcium Chloride Sodium	12.00	4.20
Sodium Alginate	0.80	0.76
Vital Wheat Gluten	10.00	9.50
Malt Extract	6.00	5.70
Caramelized Sugar	9.00	8.55
Wheat Fibre	14.00	13.30
Flavour	2.00	1.90
Carageenan	4.00	3.80
Total	1000.00	321.00

5 Example 4 – Preparation of mycoprotein-containing burger

Following the general procedure described in Example 1, the ingredients referred to in Table 3 were combined to produce the final product.

Table 3

Vegan Burger Recipe		
Ingredient	Wet Weight (g/kg)	Dry Weight (g/kg)
Mycoprotein Paste	385.20	176.60
Water	171.10	<1.00
Onions	100.00	15.00
Meatless Mince	83.30	16.70
Malt Extract	10.00	9.50
Texturized Wheat Protein	83.30	79.10
Oil	20.50	20.50
Flavour 1	30.00	28.50
Flaked Fat	38.88	36.90
Calcium Chloride Solution	3.90	1.40
Calcium Acetate	3.90	3.70
Flavour 2	3.00	2.90
Wheat Fibre	20.00	19.00
Carageenan	4.00	3.80
Sodium Alginate	0.80	0.76
Vital Wheat Gluten	10.00	9.50
Potato Protein	32.00	30.40
Total Weight	1000.00	455.00

Example 5 – Preparation of mycoprotein-containing sausage

5

Following the general procedure described in Example 1, the ingredients referred to in Table 4 were combined to produce the final product.

Table 4

Vegan Sausage Recipe		
Ingredient	Wet Weight (g/kg)	Dry Weight (g/kg)
Mycoprotein Paste	431.60	107.90
Water	170.00	<1.00
Oil	60.00	60.00
Onions	62.50	9.40
Pea Fibre	6.00	5.70
Textured Wheat Protein	37.50	35.60
Rusk	68.80	65.30
Meatless Mince	43.80	8.80
Tapioca Starch	10.00	9.50
Seasoning	31.20	29.70
Calcium Chloride Solution	4.40	1.40
Calcium Acetate	4.40	4.20
Flavour	3.00	2.80
Wheat Fibre	20.00	19.00
Carageenan	4.00	3.80
Sodium Alginate	0.80	0.76
Vital Wheat Gluten	10.00	9.50
Potato Protein	32.00	30.40
Total	1000.00	405.00

The invention is not restricted to the details of the foregoing embodiment(s). The invention extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

Claims

1. An edible formulation comprising edible fungal particles of a filamentous fungus
5 and calcium ions.
2. A formulation according to claim 1, wherein said edible formulation includes 0 wt% of components derived from animals.
- 10 3. A formulation according to claim 1 or claim 2, wherein said edible formulation includes at least 5 wt%, preferably at least 20 wt%, of said filamentous fungus on a dry matter basis.
4. A formulation according to any preceding claim, wherein said edible formulation
15 includes at least 2,000mg, preferably at least 8,000mg, of calcium ions per Kg of filamentous fungus on a dry matter.
5. A formulation according to any preceding claim, wherein said edible formulation includes at least 2,000mg, preferably at least 8,000mg, per Kg of filamentous fungus
20 on a dry matter basis, of extracellular calcium ions.
6. A formulation according to any preceding claim, wherein the total amount of calcium ions in said edible formulation is at least 5,000mg per Kg; and may be less than 40,000mg per Kg of filamentous fungus.
25
7. A formulation according to any preceding claim, wherein said edible formulation includes at least 0.100 wt% and less than 1 wt% of calcium ions in total, on a dry weight basis.
- 30 8. A formulation according to any preceding claim, wherein said edible formulation includes at least 50 wt% of water.
9. A formulation according to any preceding claim, wherein said edible formulation includes a polysaccharide, for example a sulphonated polysaccharide.
35

10. A formulation according to any preceding claim, wherein said edible formulation includes an alginate.
11. A formulation according to any preceding claim, wherein said edible formulation
5 includes gluten.
12. A formulation according to any preceding claim, wherein said edible formulation includes a protein source (A) in addition to said edible fungal particles.
- 10 13. A formulation according to claim 12, wherein said protein source (A) is a source of vegetable protein but is not a wheat-based protein.
14. A formulation according to claim 12 or claim 13, wherein said edible
formulation, on a dry weight basis, includes at least 1 wt%, preferably at least 5 wt%,
15 of protein source (A); and it may include less than 20 wt% of protein source (A).
15. A formulation according to any preceding claim, wherein said edible formulation includes acetate moieties.
- 20 16. A formulation according to any preceding claim, wherein in said edible formulation, the ratio of the wt% of acetate ions divided by the wt% of filamentous fungus on a dry matter basis is at least 0.005 and may be less than 0.04.
17. A formulation according to any preceding claim, wherein said edible formulation
25 includes at least 0.10 wt% and may include less than 2.00 wt% of acetate ions on a dry matter basis.
18. A formulation according to any preceding claim, wherein said edible formulation includes:
30
- 5,000mg of calcium ions per Kg of filamentous fungus on a dry matter basis;
 - less than 25,000mg of calcium ions per Kg of filamentous fungus on a dry matter basis;
 - 35 - at least 50 wt% of water;
 - 0 wt% of egg albumin.

19. A formulation according to any preceding claim, wherein in said edible formulation, the ratio of the wt% of acetate ions divided by the wt% of filamentous fungus on a dry matter basis is at least 0.005.

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20. A formulation according to any preceding claim, wherein said edible formulation includes at least 0.10 wt% and suitably includes less than 1.5 wt% of acetate ions, on a dry matter basis.

10 21. A formulation according to any preceding claim, wherein said fungal particles have a RNA content on a dry weight basis of less than 1.9 wt%.

22. A formulation according to any preceding claim, wherein in said edible formulation, the ratio of the wt% of filamentous fungus (on a dry matter basis) divided
15 by the wt% of water is at least 0.05 and said ratio may be less than 0.5.

23. A formulation according to any preceding claim, wherein said edible formulation is provided in a package.

20 24. A formulation according to claim 23, wherein said package includes at least 50g of said edible formulation.

25. A method of making an edible formulation, preferably as described in any preceding claim, the method comprising:

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(i) selecting a formulation comprising edible fungal particles of a filamentous fungus;

(ii) contacting said formulation with calcium ions.

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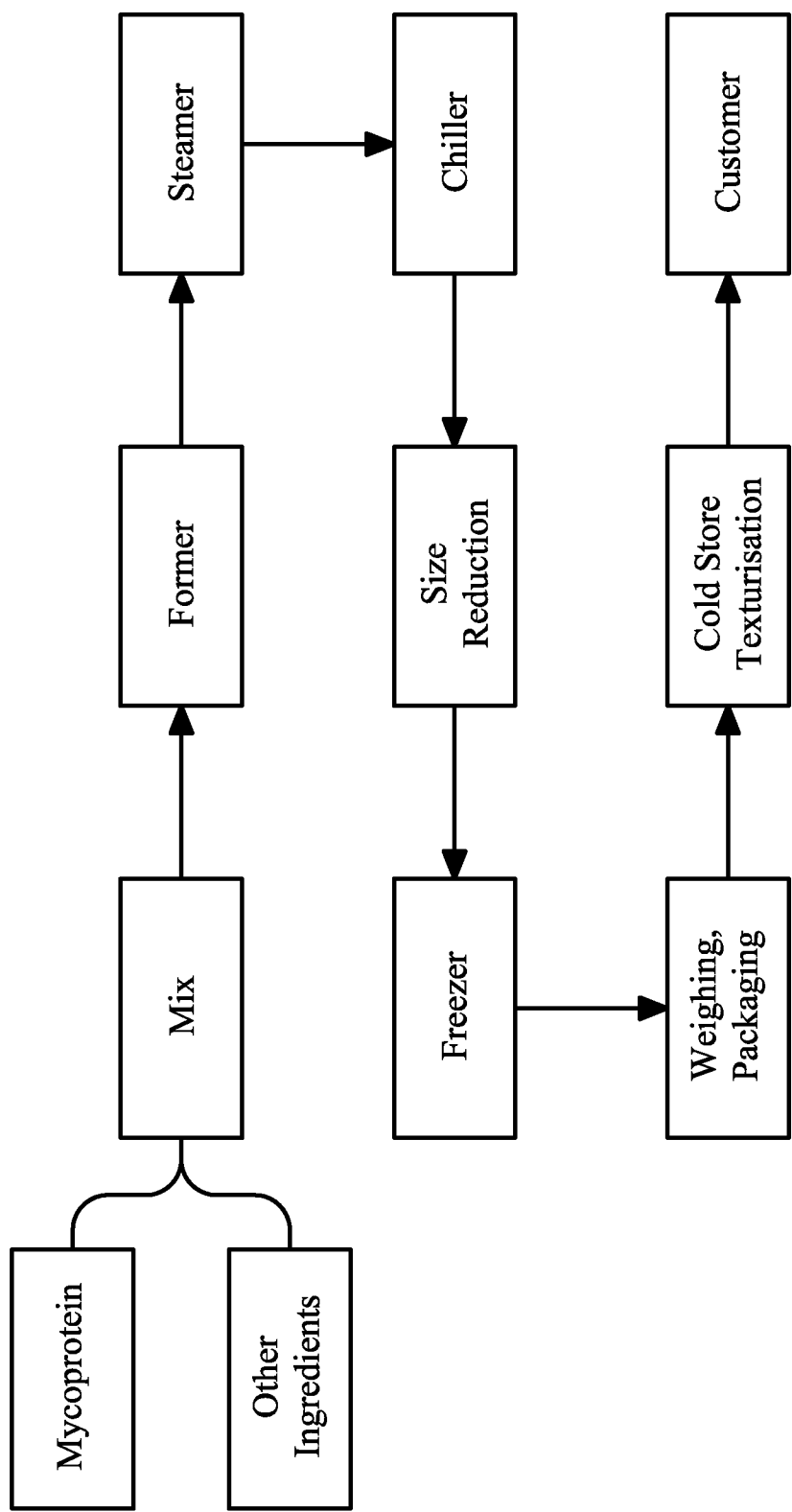


FIG. 1

INTERNATIONAL SEARCH REPORT

International application No

PCT/GB2016/050144

A. CLASSIFICATION OF SUBJECT MATTER

INV. A23J1/00
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A23L A23J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data, FSTA

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 986 960 A1 (DSM NV [NL]) 22 March 2000 (2000-03-22) the whole document	1-25
X	EP 1 133 926 A1 (DSM NV [NL]) 19 September 2001 (2001-09-19) the whole document	1-25
X	WO 99/55165 A1 (GIST BROCADES BV [NL]; HAAN BEN RUDOLF DE [NL]; DEN BURG ANTHONIUS COR) 4 November 1999 (1999-11-04)	1,25
Y	the whole document	2-24
X	WO 91/17669 A1 (ICI PLC [GB]) 28 November 1991 (1991-11-28)	1,25
Y	the whole document	2-24
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☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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Date of the actual completion of the international search

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29/03/2016

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INTERNATIONAL SEARCH REPORT

International application No

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 02/089589 A1 (MARLOW FOODS LTD [GB]; FINNIGAN TIMOTHY JOHN ANDREW [GB]; AKINTOYE MUY) 14 November 2002 (2002-11-14)	1,25
Y	the whole document	2-24
X	WO 02/089604 A2 (MARLOW FOODS LTD [GB]; FINNIGAN TIMOTHY JOHN ANDREW [GB]; BLANCHARD RO) 14 November 2002 (2002-11-14)	1,25
Y	the whole document	2-24
X	DE 28 48 699 A1 (MACLENNAN) 22 May 1980 (1980-05-22)	1,25
Y	the whole document	2-24
X	GB 2 007 077 A (BIOENTERPRISES PTY LTD) 16 May 1979 (1979-05-16)	1,25
Y	the whole document	2-24
X	WO 2004/026039 A1 (MARLOW FOODS LTD [GB]; FINNIGAN TIMOTHY JOHN ANDREW [GB]; BLANCHARD RO) 1 April 2004 (2004-04-01)	1,25
Y	the whole document	2-24
X	WO 03/007728 A2 (DSM NV [NL]; BEUDEKER ROBERT FRANCISCUS [NL]; VAN DIJK ALBERTUS ALARD) 30 January 2003 (2003-01-30)	1,25
Y	the whole document	2-24
X	WO 02/090527 A1 (MARLOW FOODS LTD [GB]; FINNIGAN TIMOTHY JOHN ANDREW [GB]; BLANCHARD RO) 14 November 2002 (2002-11-14)	1,25
Y	the whole document	2-24
A	NL 1 008 364 C2 (ADRIAAN CORNELIS KWELDAM [NL]) 30 August 1999 (1999-08-30)	1-25
A	US 4 293 575 A (COCKRAM GEOFFREY N ET AL) 6 October 1981 (1981-10-06)	1-25
A	GB 1 277 002 A (STANTON WILFRED ROBERT [GB]; WALLBRIDGE ANN JOSEPHINE) 7 June 1972 (1972-06-07)	1-25

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2016/050144

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0986960	A1	22-03-2000	AT 240660 T 15-06-2003
		AU 764133 B2 14-08-2003	
		AU 6202499 A 03-04-2000	
		CA 2336037 A1 23-03-2000	
		DE 69908132 D1 26-06-2003	
		DE 69908132 T2 04-03-2004	
		DK 1094719 T3 22-09-2003	
		EP 0986960 A1 22-03-2000	
		EP 1094719 A1 02-05-2001	
		ES 2198151 T3 16-01-2004	
		GB 2357421 A 27-06-2001	
		JP 2002524097 A 06-08-2002	
		NZ 509053 A 20-12-2002	
		PT 1094719 E 30-09-2003	
		US 7045160 B1 16-05-2006	
		WO 0015045 A1 23-03-2000	
		ZA 200007697 A 13-07-2001	
EP 1133926	A1	19-09-2001	AU 4069301 A 24-09-2001
		CA 2406811 A1 20-09-2001	
		EP 1133926 A1 19-09-2001	
		EP 1263295 A1 11-12-2002	
		GB 2377943 A 29-01-2003	
		JP 2003526353 A 09-09-2003	
		US 2003157219 A1 21-08-2003	
		WO 0167886 A1 20-09-2001	
WO 9955165	A1	04-11-1999	AU 3823099 A 16-11-1999
		CA 2330011 A1 04-11-1999	
		JP 2002512053 A 23-04-2002	
		WO 9955165 A1 04-11-1999	
WO 9117669	A1	28-11-1991	AT 107474 T 15-07-1994
		AU 654488 B2 10-11-1994	
		DE 69102640 D1 28-07-1994	
		DE 69102640 T2 27-10-1994	
		DK 0530260 T3 22-08-1994	
		EP 0530260 A1 10-03-1993	
		ES 2056651 T3 01-10-1994	
		JP H06500004 A 06-01-1994	
		WO 9117669 A1 28-11-1991	
WO 02089589	A1	14-11-2002	GB 2375944 A 04-12-2002
		WO 02089589 A1 14-11-2002	
WO 02089604	A2	14-11-2002	AU 2002251380 A1 18-11-2002
		GB 2375945 A 04-12-2002	
		GB 2390528 A 14-01-2004	
		US 2004197461 A1 07-10-2004	
		WO 02089604 A2 14-11-2002	
DE 2848699	A1	22-05-1980	NONE
GB 2007077	A	16-05-1979	AU 4130578 A 17-05-1979
		CA 1109322 A 22-09-1981	
		ES 474881 A1 16-03-1979	
		FR 2416650 A1 07-09-1979	
		GB 2007077 A 16-05-1979	

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2016/050144

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		IN 150394 B	25-09-1982
		IT 1100470 B	28-09-1985
		JP S5486695 A	10-07-1979
		JP S6232901 B2	17-07-1987
		NL 7811091 A	10-05-1979
		PH 14432 A	16-07-1981
		SE 440442 B	05-08-1985
		US 4265915 A	05-05-1981
		US 4367240 A	04-01-1983
		ZA 7806207 A	31-10-1979
WO 2004026039	A1 01-04-2004	AU 2003271854 A1	08-04-2004
		GB 2409796 A	13-07-2005
		US 2006105080 A1	18-05-2006
		WO 2004026039 A1	01-04-2004
WO 03007728	A2 30-01-2003	AU 2002331272 A1	03-03-2003
		WO 03007728 A2	30-01-2003
WO 02090527	A1 14-11-2002	GB 2375943 A	04-12-2002
		GB 2390527 A	14-01-2004
		US 2004185162 A1	23-09-2004
		US 2010213293 A1	26-08-2010
		WO 02090527 A1	14-11-2002
NL 1008364	C2 30-08-1999	NONE	
US 4293575	A 06-10-1981	BR 7603766 A	08-02-1977
		CA 1092426 A	30-12-1980
		DE 2626035 A1	23-12-1976
		FI 761694 A	14-12-1976
		FR 2313872 A1	07-01-1977
		GB 1502455 A	01-03-1978
		IT 1063598 B	11-02-1985
		JP S5923770 B2	05-06-1984
		JP S51151380 A	25-12-1976
		MX 3221 E	28-07-1980
		SE 7606618 A	14-12-1976
		US 4293575 A	06-10-1981
		US 4378378 A	29-03-1983
GB 1277002	A 07-06-1972	GB 1277002 A	07-06-1972
		MY 7800447 A	31-12-1978